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Chiang Yeh

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EXAMINER

ROOT, ROBERT M

ART UNIT

PAPER NUMBER

2616

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/690,277	<b>Applicant(s)</b> YEH ET AL.	
	<b>Examiner</b> ROBERT ROOT	<b>Art Unit</b> 2616	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 20 October 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-28 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-28 is/are rejected.
- 7) ☒ Claim(s) 27 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on Oct 20, 2003 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)          | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____                                      |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)          | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Drawings***

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character “TABLE2” has been used to designate both Second Table 137B and Third Table 137C on Figure 2. Examiner recommends Third Table 137C should be TABLE3 within Table Array 230.
2. The drawings are objected to under 37 CFR 1.83(a) because they fail to show 35-353 in Figure 3 as described in the specification on Page 8, Line 15. Any structural detail that is essential for a proper understanding of the disclosed invention should be shown in the drawing. MPEP § 608.02(d).
3. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either “Replacement Sheet” or “New Sheet” pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

### ***Specification***

4. The disclosure is objected to because of the following informalities:
  - Page 4, Line 9 discloses “is operatively to a plurality communications network,” which is not clear;

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- Page 6, Line 19 discloses “four nibbles are *extracts* to perform.” Examiner recommends the word *extracts* should be changed to *extracted* to make sentence more clear to an individual with ordinary skill in the art;
- Page 8, Line 17 needs space inserted between “*ofthe*,”
- Page 9, Line 8 discloses in reference to Figure 2, “first TSC 210A uses the key 252 as a pointer.” Examiner recommends 252 should be modified to 252A, which accurately shows a connection between ADDR MNGR 206 and TSC 210A; and
- Page 16, Line 18 discloses “hierarchical tables to be *search*.” Examiner recommends modifying the word *search* to *searched* to make sentence more clear to an individual with ordinary skill in the art.

Appropriate correction is required.

### ***Claim Objections***

5. Claim 27 objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 27 has been written as a dependent claim to itself.

Examiner will broadly interpret Claim 27 as a dependent claim to Claim 26.

6. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 101***

7. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

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Claims 1-11 and 13-28 are rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter. Claims disclose a process that does nothing more than manipulate abstract concepts with the end result being the generation of a score. The claimed invention fails to produce a practical application. No mention in the claims has been made on what the invention does with the score. Thus, a process consisting solely of mathematical operations, i.e., converting one set of numbers into another set of numbers, does not manipulate appropriate subject matter and thus cannot constitute a statutory process. The claimed invention must produce a “useful, concrete and tangible result”. *State Street Bank & Trust Co. v. Signature Financial Group Inc.*, 149 F.3d 1368, 1373, 47 USPQ2d 1596, 1601-1602 (Fed. Cir. 1998). In practical terms, claims define non-statutory processes if they:

- consist solely of mathematical operations without some claimed practical application (i.e., executing a “mathematical algorithm”); or
- simply manipulate abstract ideas, e.g., a bid (Schrader, 22 F.3d at 293-94, 30 USPQ2d at 1458-59) or a bubble hierarchy (Warmerdam, 33 F.3d at 1360, 31 USPQ2d at 1759), without some claimed practical application.

Please reference MPEP 2106.02.

### ***Claim Rejections - 35 USC § 112***

8. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

9. Claims 15-16 and 19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite in that it fails to point out what is included or excluded by the claim language. This claim is an omnibus type claim.

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10. Claim 15 recites the limitation "the reverting step" in Line 1. There is insufficient antecedent basis for this limitation in the claim. There was no mention of a reverting step in Claim 13, which Claim 15 is dependent, or any previous claim.

11. Claim 16 recites the limitation "the depth counter" in Line 2. There is insufficient antecedent basis for this limitation in the claim. There was no mention of a reverting step in Claim 14, which Claim 16 is dependent, or any previous claim.

12. Claim 19 recites the limitation "hierarchical table" in Line 2. There is insufficient antecedent basis for this limitation in the claim. There was no mention of a hierarchical table in Claim 1, which Claim 19 is dependent.

***Claim Rejections - 35 USC § 103***

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

14. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

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15. Claims 1, 5-9, 11-12, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Brian Scott Messenger (US 2003/0231630) in view of Hebb et al (US 6,587,463) and Kadambi et al (US 6,707,817).

16. As for Claim 1, Messenger discloses a multi-stage (Paragraph 0011 discloses lookup tables) classification method (Abstract discloses packet classification architecture) of matching a plurality of strings (Paragraph 0069 discloses matching input data patterns) to one or more policies (Paragraph 0011 discloses lookup tables in memory for addresses and header information) embodied in a plurality of stages (Paragraph 0111 discloses saving and retrieving values from various equation mapping tables), each stage comprising one or more entries (Paragraph 0111 discloses multiple entry tables); the method comprising the steps of:

(a) generating a current pointer (Paragraph 0108 discloses generating a randomizer value) to a current stage (Paragraph 0111 discloses randomizer value pointing to a location in a table) using a current string (Paragraph 0107 discloses input data being manipulated into bit words);

(b) the searching step further comprising the steps of:

(ii) new pointers (Paragraph 0327 discloses generating a pointer, therefore a new pointer is in existence), wherein each of the new pointers (Paragraph 0327 discloses generating a pointer, therefore a new pointer is in existence), and

(iii) incrementing the current string (Paragraph 0164 discloses a value is incremented after each word is written to, or read).

17. Messenger does not expressly disclose each entry comprising a criterion and a pointer to a subsequent stage; (b) searching one or more criteria in the current stage; (i) comparing the current string to the criteria of one or more entries beginning with entries indicated by the one or

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more current pointers; (ii) defining the one or more current pointers equal to one **or** more; is associated with a criterion in the current stage that matches the current string; (iii) incrementing the current stage; (c) repeating the searching step for each of the plurality of stages; (d) generating a score for each match identified in each of the plurality of stages; and (e) selecting the policy of the one or more policies associated with a highest cumulative score, the cumulative score being the sum of the score for each match at each stage of the plurality of stages.

18. Hebb discloses in the same field of endeavor each entry comprising a criterion and a pointer to a subsequent stage (Column 9, Lines 35-39 discloses if any rule memory entry encountered in the search is a pointer type of entry, it points to another rule memory entry); (b) searching one or more criteria in the current stage (Column 1, Lines 27-47 discloses a specialized search of one or more forwarding tables for forwarding information on the packet); (i) comparing the current string to the criteria of one or more entries beginning with entries (Abstract discloses the criterion memory entry contains one or more values to be used as comparands on one side of the comparison, where corresponding values from a received packet appear on the other side of the comparison) indicated by the one or more current pointers (Abstract discloses identified by the criterion memory pointer); (ii) defining the one or more current pointers equal to one **or** more (Abstract discloses defining a comparison operation to be performed, such as equal, between a criterion memory entry containing one or more values to be used as comparands on one side of the comparison, where corresponding values from a received packet appear on the other side of the comparison); is associated with a criterion in the current stage that matches the current string (Abstract discloses the criterion memory entry identified by the criterion memory pointer); (iii) incrementing the current stage (Column 11, Lines 54-59 discloses rule memory address



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increments by one); and (c) repeating the searching step for each of the plurality of stages (Abstract discloses procedure is repeated for a sequence of rule memory entries).

19. Hebb discloses this difference for the purpose of providing high-speed packet classification for packet filtering purposes. The architecture of the classification apparatus provides substantial flexibility in the definition of complex filter criteria. Robust filtering can be performed at a sufficiently high rate to avoid degrading packet forwarding performance (Column 1, Line 66 – Column 2, Line 6).

20. Therefore, it would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the multi-stage classification method disclosed by Messenger and add to it the feature as disclosed above by Hebb to create a multi-stage classification method of matching a plurality of strings to one or more policies embodied in a plurality of stages with high-speed classification for packet filtering to avoid degrading packet forwarding performance.

21. Messenger in view of Hebb do not expressly disclose (d) generating a score for each match identified in each of the plurality of stages; and (e) selecting the policy of the one or more policies associated with a highest cumulative score, the cumulative score being the sum of the score for each match at each stage of the plurality of stages.

22. Kadambi discloses in the same field of endeavor (d) generating a score for each match identified in each of the plurality of stages (Column 37, Lines 10-22 discloses generating a search key with is used to search for a match in rules tables and generating an action bit based on determined matches); and (e) selecting the policy of the one or more policies associated (Column 34, Lines 17-19 discloses identifying the filter number, which is used to match entries in the

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rules table) with a highest cumulative score, the cumulative score being the sum of the score for each match at each stage of the plurality of stages (Column 37, Lines 32-36 discloses a full match occurs when the filter select+egress module id+igress port+egress port+packet format+filter value matches an entry in the rules table; therefore, if there is a full match, then the associated actions from the matched rules table entry are applied).

23. Kadambi discloses this difference for the purpose of advancing network switching technology which requires high performance switching of data packets or data cells. A switch utilizing the disclosed elements, and a system performing the disclosed steps, provides cost and operational savings (Column 1, Lines 29-35).

24. Therefore, it would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the combined method of Messenger and Hebb and add to it the feature as disclosed above by Kadambi to create a multi-stage classification method of matching a plurality of strings to one or more policies embodied in a plurality of stages with high performance switching of data packets or data cells to provide cost and operational savings.

25. As for Claim 5, Messenger in view of Hebb and Kadambi disclose the one or more criteria (Hebb, Column 1, Lines 27-47 discloses forwarding information on the packet) comprise one **or** more numerical values (Kadambi, Column 24, Line 48 – Column 25, Line 64 discloses a numeric entry).

26. As for Claim 6, Messenger in view of Hebb and Kadambi disclose the one or more criteria comprise one **or** more wildcard operators (Hebb, Column 9. Lines 37-49 disclose a don't care operator code).

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27. As for Claim 7, Messenger in view of Hebb and Kadambi disclose one or more criteria comprise one or more logical operations (Hebb, Column 9, Lines 22-36 disclose criterion operator field contains eight 3-bit logical operator codes).

28. As for Claim 8, Messenger in view of Hebb and Kadambi disclose the one **or** more logical operations are selected from the group consisting of: Boolean operations, relational operations (Hebb, Column 9, Lines 37-49 disclose the relational operations of greater than, less than, and equal), string operations, set operations, and a combination thereof.

29. As for Claim 9, Messenger in view of Hebb and Kadambi disclose wildcard operators (Hebb, Column 9, Lines 37-49 disclose a don't care operator code) are assigned a lower score (Kadambi, Column 37, Lines 10-22 disclose no match set to 0) than the score assigned to an exact match (Kadambi, Column 37, Lines 10-22 disclose full match set to 1) with a numerical value (Kadambi, Column 24, Line 48 – Column 25, Line 64 discloses a numeric entry).

30. As for Claim 11, Messenger in view of Hebb and Kadambi disclose the plurality of strings comprise a plurality of nibbles (Messenger, Paragraph 0107 discloses input data manipulated in 32-bit words; an individual with ordinary skill in the art would recognize that a nibble comprises one or more bits) derived from a protocol data unit (PDU; Messenger, Paragraph 0012 discloses an Application Specific Integrated Circuit to evaluate packet headers in a rapid fashion which an individual with ordinary skill in the art would recognize to have corresponding functions to a PDU).

31. As for Claim 12, Messenger in view of Hebb and Kadambi disclose the plurality of nibbles (Messenger, Paragraph 0107 discloses input data manipulated in 32-bit words; an individual with ordinary skill in the art would recognize that a nibble comprises one or more bits)

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are selected from one or more fields (Hebb, Column 9, Lines 22-36) of the PDU (Messenger, Paragraph 0012 discloses an Application Specific Integrated Circuit to evaluate packet headers in a rapid fashion which an individual with ordinary skill in the art would recognize to have corresponding functions to a PDU), the fields being selected from the group consisting of: source address (Hebb, Column 9, Lines 22-36), destination address (Hebb, Column 9, Lines 22-36), input port on which the PDU was received, source transmission control protocol (TCP) port (Hebb, Column 9, Lines 22-36), source user datagram port (UDP; Kadambi, Column 39, Lines 16-36), destination UDP (Kadambi, Column 39, Lines 16-36), layer 3 packet type (Kadambi, Column 11, Lines 4-8), layer 4 packet type, TCP acknowledgement flag, acknowledgement bit, type of service value, and PDU payload.

32. As for Claim 18, Messenger in view of Hebb and Kadambi disclose the number of stages is greater than two (Kadambi, Abstract discloses layer 2 lookup tables and layer 3 layer lookup tables; an individual would recognize there would be a minimum of two tables for each group of tables, which would bring a cumulative total to four, which would anticipate the number of stages being greater than two).

33. Claim 2 rejected under 35 U.S.C. 103(a) as being unpatentable over Brian Scott Messenger (US 2003/0231630) in view of Hebb et al (US 6,587,463) and Kadambi et al (US 6,707,817) as applied to Claim 1 and further in view of Nevin Chaddha (US 6,154,572).

34. As for Claim 2, Messenger in view of Hebb and Kadambi disclose each of the plurality of stages (Messenger, Paragraph 0111 discloses saving and retrieving values from various equation mapping tables), wherein comprising criteria associated with the one or more policies (Kadambi, Column 4, Lines 35-60 discloses a table of forwarding rules based upon which MAC (media

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access controller) addresses exist on which ports of the bridge, and pass packets which are destined for an address which is located after the output).

35. Messenger in view of Hebb and Kadambi do not expressly disclose a hierarchical table; and each hierarchical table.

36. Chaddha discloses in the same field of endeavor a hierarchical table (Column 5, Lines 9-17); and each hierarchical table (Column 5, Lines 9-17).

37. Chaddha discloses this difference for the purpose of providing a more optimal combination of effectiveness, speed, and scalability (Column 4, Lines 4-21).

38. Therefore, it would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the combined method of Messenger, Hebb, and Kadambi and add to it the feature as disclosed above by Chaddha to create a multi-stage classification method of matching a plurality of strings to one or more policies embodied in a plurality of stages with a more optimal combination of effectiveness, speed, and scalability.

39. Claim 3 rejected under 35 U.S.C. 103(a) as being unpatentable over Brian Scott Messenger (US 2003/0231630) in view of Hebb et al (US 6,587,463) and Kadambi et al (US 6,707,817) and further in view of Nevin Chaddha (US 6,154,572) as applied to Claim 2 and further in view of Toshiya Takahashi (US 6,633,592).

40. As for Claim 3, Messenger in view of Hebb and Kadambi further in view of Chaddha disclose the criteria are arranged in one or more criterion groups (Hebb, Abstract discloses the criterion memory entry contains one **or** more values to be used as comparands on one side of the comparison, where corresponding values from a received packet appear on the other side of the comparison); hierarchical table (Chaddha, Column 5, Lines 9-17) shares a common criterion

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(Hebb, Abstract discloses a comparison operation to be performed, such as equal, between a criterion memory entry containing one or more values to be used as comparands on one side of the comparison, where corresponding values from a received packet appear on the other side of the comparison) hierarchical table (Chaddha, Column 5, Lines 9-17).

41. Messenger in view of Hebb and Kadambi further in view of Chaddha do not expressly disclose wherein each criterion of a criterion group in a child; and in a parent.

42. Takahashi discloses in the same field of endeavor wherein each criterion of a criterion group in a child (Takahashi, Column 11, Lines 56-65 discloses child indexes and child packet “id”); and in a parent (Takahashi, Column 11, Lines 56-65 discloses parent indexes and parent packet “id”).

43. Takahashi discloses this difference for the purpose of reducing data quantity and increase an efficiency of data processing (Column 1, Lines 9-20).

44. Therefore, it would have been obvious to one of ordinary skill in the art at the time the applicant’s invention was made to modify the combined method of Messenger, Hebb, Kadambi, and Chaddha and add to it the feature as disclosed above by Takahashi to create a multi-stage classification method of matching a plurality of strings to one or more policies embodied in a plurality of stages with reduced data quantity and increase an efficiency of data processing.

45. As for Claim 4, Messenger in view of Hebb and Kadambi further in view of Chaddha further in view of Takahashi disclose the step of comparing the current string (Messenger, Paragraph 0107 discloses input data being manipulated into 32-bit words) to the criteria of one or more entries is limited to the criteria of one or more criterion groups (Takahashi, Column 11, Lines 56-65 disclose parent indexes, child indexes, parent packet “id,” and child packet “id”)

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beginning with entries indicated by the one or more current pointers (Hebb, Column 11, Lines 60-64 disclose entry encountered in the search is a pointer type of entry, it points to another rule memory entry rather than to a criterion memory entry).

46. As for Claim 13, Messenger in view of Hebb and Kadambi further in view of Chaddha further in view of Takahashi disclose wherein the step of comparing comprises comparing the current string to the criteria of one or more entries until (Hebb, Abstract) a match (Messenger, Paragraph 072) is detected (Hebb, Abstract).

47. Claim 10 rejected under 35 U.S.C. 103(a) as being unpatentable over Brian Scott Messenger (US 2003/0231630) in view of Hebb et al (US 6,587,463) and Kadambi et al (US 6,707,817) as applied to Claim 1 and further in view of Michael Robert Morford (US 7,324,447).

48. As for Claim 10, Messenger in view of Hebb and Kadambi disclose the current pointer of the current pointer generating step is generated (Messenger, Paragraph 0108 discloses generating a randomizer value; Messenger, Paragraph 0111 discloses randomizer value pointing to a location in a table; Messenger, Paragraph 01111 discloses randomizer values containing 0, 1, 2, 3, or 4 entries).

49. Messenger in view of Hebb further in view of Kadambi do not expressly disclose by hashing the first string of the plurality of strings.

50. Morford discloses by hashing the first string of the plurality of strings (Column 9, Line 60 – Column 10, Line 21 discloses to facilitate association of an existing control block object to subsequent packets associated with a data flow or connection, flow database 135 further maintains a control block hash table including a key comprising a hashedvalue computed from a string comprising the inside IP address, outside IP address, inside port number, outside port

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number, and protocol type (e.g., TCP, UDP, etc.) associated with a pointer to the corresponding control block object.).

51. Morford discloses this difference for the purpose of efficient allocation of network resources, such as available network bandwidth, for increased reliance on distributed computer environments and wide area networks to accomplish critical tasks (Column 2, Lines 25-42).

52. Therefore, it would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the combined method of Messenger, Hebb, and Kadambi and add to it the feature as disclosed above by Morford to create a multi-stage classification method of matching a plurality of strings to one or more policies embodied in a plurality of stages with efficient allocation of network resources, such as available network bandwidth, for increased reliance on distributed computer environments and wide area networks to accomplish critical tasks.

53. Claim 14 rejected under 35 U.S.C. 103(a) as being unpatentable over Brian Scott Messenger (US 2003/0231630) in view of Hebb et al (US 6,587,463) and Kadambi et al (US 6,707,817) further in view of Navin Chaddha (US 6,154,572) further in view of Toshiya Takahashi (US 6,633,592) as applied to Claim 13 and further in view of Henderson et al (US 5,726,979).

54. As for Claim 14, Messenger in view of Hebb and Kadambi further in view of Chaddha further in view of Takahashi disclose to the searching step (Hebb, Column 1, Lines 27-47 discloses a specialized search of one or more forwarding tables for forwarding information on the packet) and the repeating step (Hebb, Abstract discloses procedure is repeated for a sequence of rule memory entries), comprising:



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(a) the current stage (Messenger, Paragraph 0327 discloses generate the pointer in the primary randomizer table for the input that is being removed) and the current string (Paragraph 0107 discloses input data being manipulated into 32-bit words), whereby searching may return to a preceding criterion group (Takahashi, Column 11, Lines 56-65 disclose parent indexes, child indexes, parent packet "id," and child packet "id") of a hierarchical table (Takahashi, Column 12, Lines 25-30), and

(b) selecting (Messenger, Paragraph 0413) a criteria (Hebb, Column 8, Lines 35-45) of said criterion group (Takahashi, Column 11, Lines 56-65 disclose parent indexes, child indexes, parent packet "id," and child packet "id) and compared (Hebb, Abstract).

55. Messenger in view of Hebb and Kadambi further in view of Chaddha further in view of Takahashi do not expressly disclose a reverting step, subsequent and prior to; (a) decrementing of a preceding; (b) preceding and not previously processed with the current string; and (c) resuming the searching step.

56. Henderson discloses in the same field of endeavor a reverting step, subsequent and prior to (Henderson, Column 22, Lines 40-49 discloses revertive switching with an order of preference of priority values being established; Column 22, Line 63 - Column 23, Line 12 disclose any arrangement of priorities can be assigned); (a) decrementing (Henderson, Column 22, Lines 40-49 discloses detecting and locating failures within the network, and communicating the related failure and restoration indications) of a preceding (Henderson, Column 22, Lines 40-49 disclose switched back); (b) preceding (Henderson, Column 22, Lines 40-49 disclose switched back) and not previously processed with the current string (Henderson, Column 24, Lines 16-23 discloses execution resumes to select one of the remaining unprocessed data streams); and (c) resuming

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the searching step (Henderson, Column 24, Lines 16-23 disclose the process determines that other data streams must be processed, then execution resumes to select one of the remaining unprocessed data streams).

57. Henderson discloses these differences for the purpose of managing diverse network equipments conforming to a variety of interface standards, which determine the current state of a network, restore it to a state satisfying various engineering guidelines, and be flexible enough to allow upgrades without violating the engineering design guidelines (Column 2, Lines 16-26).

58. Therefore, it would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the combined method of Messenger, Hebb, Kadambi, Chaddha, and Takahashi and add to it the feature as disclosed above by Henderson to create a multi-stage classification method of matching a plurality of strings to one or more policies embodied in a plurality of stages managing diverse network equipments conforming to a variety of interface standards, which determine the current state of a network, restore it to a state satisfying various engineering guidelines, and be flexible enough to allow upgrades without violating the engineering design guidelines.

59. Claim 15 rejected under 35 U.S.C. 103(a) as being unpatentable over Brian Scott Messenger (US 2003/0231630) in view of Hebb et al (US 6,587,463) and Kadambi et al (US 6,707,817) further in view of Navin Chaddha (US 6,154,572) further in view of Toshiya Takahashi (US 6,633,592) as applied to Claim 13 and further in view of Henderson et al (US 5,726,979) and Jacobson et al (US 6,426,959).

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60. As for Claim 15, Messenger in view of Hebb and Kadambi further in view of Chaddha further in view of Takahashi do not expressly disclose the reverting step further includes the step of incrementing a depth counter.

61. Henderson discloses in the same field of endeavor the reverting step (Henderson, Column 22, Lines 40-49 discloses revertive switching with an order of preference of priority values being established).

62. Henderson discloses these differences for the purpose of managing diverse network equipments conforming to a variety of interface standards, which determine the current state of a network, restore it to a state satisfying various engineering guidelines, and be flexible enough to allow upgrades without violating the engineering design guidelines (Column 2, Lines 16-26).

63. Therefore, it would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the combined method of Messenger, Hebb, Kadambi, Chaddha, and Takahashi and add to it the feature as disclosed above by Henderson to create a multi-stage classification method of matching a plurality of strings to one or more policies embodied in a plurality of stages managing diverse network equipments conforming to a variety of interface standards, which determine the current state of a network, restore it to a state satisfying various engineering guidelines, and be flexible enough to allow upgrades without violating the engineering design guidelines.

64. Messenger in view of Hebb and Kadambi further in view of Chaddha further in view of Takahashi further in view of Henderson do not expressly disclose further includes the step of incrementing a depth counter.

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65. Jacobson discloses in the same field of endeavor further includes the step of incrementing a depth counter (Jacobson, Column 2, Line 52 - Column 3, Line 12 discloses the queuing depth with incremental capacity).

66. Jacobson discloses this difference for the purpose of providing tools to efficiently allocate transmission resources (Column 2, Lines 13-21).

67. Therefore, it would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the combined method of Messenger, Hebb, Kadambi, Chaddha, Takahashi, and Henderson and add to it the feature as disclosed above by Jacobson to create a multi-stage classification method of matching a plurality of strings to one or more policies embodied in a plurality of stages providing tools to efficiently allocate transmission resources.

68. Claim 16 rejected under 35 U.S.C. 103(a) as being unpatentable over Brian Scott Messenger (US 2003/0231630) in view of Hebb et al (US 6,587,463) and Kadambi et al (US 6,707,817) further in view of Navin Chaddha (US 6,154,572) further in view of Toshiya Takahashi (US 6,633,592) further in view of Henderson et al (US 5,726,979) as applied to Claim 14 and in further view of Jacobson et al (US 6,426,959).

69. As for Claim 16, Messenger in view of Hebb and Kadambi further in view of Chaddha further in view of Takahashi further in view of Henderson disclose the method terminates (Hebb, Column 12, Lines 4-16 discloses search terminates).

70. Messenger in view of Hebb and Kadambi further in view of Chaddha further in view of Takahashi further in view of Henderson do not expressly disclose if the depth counter has been incremented a predetermined number of times.

71. Jacobson discloses in the same field of endeavor if the depth counter has been incremented a predetermined number of times (Column 2, Line 52—Column 3, Line 12 discloses when the queuing depth reaches a predetermined amount, the incremental capacity of the link may far exceed the bandwidth required).

72. Jacobson discloses this difference for the purpose of providing tools to efficiently allocate transmission resources (Column 2, Lines 13-21).

73. Therefore, it would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the combined method of Messenger, Hebb, Kadambi, Chaddha, Takahashi, and Henderson and add to it the feature as disclosed above by Jacobson to create a multi-stage classification method of matching a plurality of strings to one or more policies embodied in a plurality of stages providing tools to efficiently allocate transmission resources.

74. Claim 17 rejected under 35 U.S.C. 103(a) as being unpatentable over Brian Scott Messenger (US 2003/0231630) in view of Hebb et al (US 6,587,463) and Kadambi et al (US 6,707,817) further in view of Navin Chaddha (US 6,154,572) further in view of Toshiya Takahashi (US 6,633,592) as applied to Claim 13 and further in view of Kobayashi et al (US 6,333,932).

75. As for Claim 17, Messenger in view of Hebb and Kadambi further in view of Chaddha further in view of Takahashi disclose the searching step further includes the step of:

(a) generating an estimated cumulative score (Kadambi, Column 18, Lines 5-32 discloses estimating the cell count) at an intermediate (Kadambi, Column 14, Line 66 – Column 15, Line 18 discloses a table data communication between a CPU and SOC; an individual with ordinary

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skill in the art would view this as intermediate between two points) hierarchical table (Takahashi, Column 12, Lines 25-30),

(b) determining whether the estimated cumulative score (Kadambi, Column 18, Lines 5-32 disclose checking the estimated the cell count) could satisfy (Hebb, Abstract discloses compares), and

(c) ending the searching step (Hebb, Column 1, Lines 27-47 discloses a specialized search) if the estimated cumulative score fails could not satisfy (Kadambi, Column 18, Lines 5-32 discloses the arbitration process involving the estimated cell count determination is unsuccessful).

76. Messenger in view of Hebb and Kadambi further in view of Chaddha further in view of Takahashi do not expressly disclose (b) a predetermined score threshold, and (c) the score threshold.

77. Kobayasi discloses in the same field of endeavor (b) a predetermined score threshold (Column 2, Lines 9-19 disclose a predetermined threshold), and (c) the score threshold (Column 2, Lines 9-19 disclose a predetermined threshold).

78. Kobayasi discloses this difference for the purpose of buffering a number of input cells forming a data frame in a higher order layer, thereby reducing the capacity of memory (Column 12, Lines 11-15).

79. Therefore, it would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the combined method of Messenger, Hebb, Kadambi, Chaddha, and Takahashi and add to it the feature as disclosed above by Kobayasi to create a multi-stage classification method of matching a plurality of strings to one or more policies

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embodied in a plurality of stages buffering a number of input cells forming a data frame in a higher order layer, thereby reducing the capacity of memory.

80. Claim 19 rejected under 35 U.S.C. 103(a) as being unpatentable over Brian Scott Messenger (US 2003/0231630) in view of Hebb et al (US 6,587,463) and Kadambi et al (US 6,707,817) as applied to Claim 1 and further in view of Caldara et al (US 5,748,629) and Toshiya Takahashi (US 6,633,592).

81. As for Claim 19, Messenger in view of Hebb and Kadambi disclose the pointer (Hebb, Abstract) associated with the selected policy points to an action in a rules table (Kadambi, Column 4, Lines 35-60 discloses a table of forwarding rules).

82. Messenger in view of Hebb and Kadambi do not expressly disclose in which the last hierarchical table.

83. Caldara discloses in the same field of endeavor a last stage (Caldara, Column 6, Line 44 – Column 7, Line 9 discloses a last queue).

84. Caldara discloses this difference for the purpose of accommodating network traffic having such dissimilar delay and bandwidth requirements, and thus providing low-cost, highly efficient integrated services (Column 1, Lines 57-60).

85. Therefore, it would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the combined method of Messenger, Hebb, and Kadambi and add to it the feature as disclosed above by Caldara to create a multi-stage classification method of matching a plurality of strings to one or more policies embodied in a plurality of stages accommodating network traffic having such dissimilar delay and bandwidth requirements, and thus providing low-cost, highly efficient integrated services.

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86. Messenger in view of Hebb and Kadambi further in view of Caldara do not expressly disclose a hierarchical table.

87. Takahashi discloses in the same field of endeavor in which a hierarchical table (Column 12, Lines 25-30).

88. Takahashi discloses this difference for the purpose of reducing data quantity and increase an efficiency of data processing (Column 1, Lines 9-20).

89. Therefore, it would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the combined method of Messenger, Hebb, Kadambi, and Caldara and add to it the feature as disclosed above by Takahashi to create a multi-stage classification method of matching a plurality of strings to one or more policies embodied in a plurality of stages with reduced data quantity and increase an efficiency of data processing.

90. Claim 20 rejected under 35 U.S.C. 103(a) as being unpatentable over Brian Scott Messenger (US 2003/0231630) in view of Hebb et al (US 6,587,463) and Kadambi et al (US 6,707,817) as applied to Claim 11 and further in view of Moshe Stark (US 2003/0191740).

91. As for Claim 20, Messenger in view of Hebb and Kadambi disclose one or more of the plurality of nibbles (Messenger, Paragraph 0107 discloses input data manipulated in 32-bit words; an individual with ordinary skill in the art would recognize that a nibble comprises one or more bits) is extracted from a PDU (Messenger, Paragraph 0012 discloses an Application Specific Integrated Circuit to evaluate packet headers in a rapid fashion which an individual with ordinary skill in the art would recognize to have corresponding functions to a PDU).

92. Messenger in view of Hebb further in view of Kadambi do not expressly disclose Internet Protocol (IP) version 4 or IP version 6 address.



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93. Stark discloses in the same field of endeavor Internet Protocol (IP) version 4 (Paragraph 0137) or IP version 6 address (Paragraph 0062).

94. Stark discloses this difference for the purpose of providing a method of performing operations on multi-dimensional entries having associated data or actions characterized by high storage efficiency and reduced power consumption, with respect to prior art methods. It would be of further advantage if the method would provide unlimited scalability, both horizontally (in terms of the number of fields and field width) and vertically (in terms of the number of classification rules), and in addition, would have a classification clock that is independent of the classification key width (Paragraph 0026).

95. Therefore, it would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the combined method of Messenger, Hebb, and Kadambi and add to it the feature as disclosed above by Stark to create a multi-stage classification method of matching a plurality of strings to one or more policies embodied in a plurality of stages performing operations on multi-dimensional entries having associated data or actions characterized by high storage efficiency and reduced power consumption.

96. Claims 21-23 rejected under 35 U.S.C. 103(a) as being unpatentable over Brian Scott Messenger (US 2003/0231630) in view of Kadambi et al (US 6,707,817), Navin Chaddha (US 6,154,572), Toshiya Takahashi (US 6,633,592), and Hebb et al (US 6,587,463).

97. As for Claim 21, Messenger discloses a multi-stage (Paragraph 0011 discloses lookup tables) classification method (Abstract discloses packet classification architecture) of selecting a policy based upon a plurality of protocol data unit (PDU; Paragraph 0012 discloses an Application Specific Integrated Circuit to evaluate packet headers in a rapid fashion which an

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individual with ordinary skill in the art would recognize to have corresponding functions to a PDU) nibbles (Paragraph 0107 discloses input data manipulated in 32-bit words; an individual with ordinary skill in the art would recognize that a nibble comprises one or more bits), the method comprising the steps of:

- (a) generating, from a first nibble (Paragraph 0107 discloses input data manipulated in 32-bit words; an individual with ordinary skill in the art would recognize that a nibble comprises one or more bits), a first pointer (Paragraph 0108 discloses generating a randomizer value) to a first table (Paragraph 0111 discloses randomizer value pointing to a location in a table) of a plurality of tables (Paragraph 0111 discloses multiple entry tables) that embody the policies (Paragraph 0011 discloses lookup tables in memory for addresses and header information), each table comprising one or more criteria and associated pointer (Paragraph 0011 discloses lookup tables in memory for addresses and header information; an individual with ordinary skill in the art would recognize that the address in the table being written onto the nibble would point the nibble to the next location);
- (b) the first nibble (Paragraph 0107 discloses input data being manipulated into 32-bit words; an individual with ordinary skill in the art would recognize this as a nibble)
- (c) the first nibble (Paragraph 0107 discloses input data being manipulated into 32-bit words; an individual with ordinary skill in the art would recognize this as a nibble)
- (d) the plurality of nibbles (Paragraph 0015 discloses a sequence of words), the searching step further comprising:
  - (i) beginning (Paragraph 0140 discloses each novel circuit begins checking), and

(ii) the current nibble (Paragraph 0107 discloses input data manipulated in 32-bit words; an individual with ordinary skill in the art would recognize that a nibble comprises one or more bits).

98. Messenger does not expressly disclose of selecting a policy from a plurality of policies; the plurality of policies being embodied in a plurality of hierarchical tables; the plurality of hierarchical tables comprising a first table and one or more child tables; (b) comparing the first packet with each of the one or more criteria of the first table beginning with the criterion indicated by the first pointer; (c) identifying one or more matches between the first packet and one or more associated pointers to a child table; (d) searching a current child table with a current nibble; (i) comparing the current nibble with one or more criteria of the child table, with the criteria indicated by each of the one or more pointers obtained in a previous identifying step, and (ii) identifying one or more matches between the current packet and one or more pointers to a next child table, each pointer associated with a match; (e) repeating the searching step for each child table of the plurality of tables; (f) determining a score for each match identified in each hierarchical table; and (g) selecting the policy of the one or more policies associated with a highest cumulative score, the cumulative score being the sum of the scores for each match at each of the plurality of hierarchical tables.

99. Kadambi discloses in the same field of endeavor of selecting a policy from a plurality of policies (Column 34, Lines 17-19 discloses identifying the filter number, which is used to match entries in the rules table); the plurality of policies being embodied in a plurality of tables (Abstract discloses lookup tables for layer 2 and layer 3) the plurality of tables comprising a first (Abstract discloses lookup tables for layer 2 and layer 3; an individual with ordinary skill in the

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art would be able to recognize a first table from this group) and one or more tables (Abstract discloses lookup tables for layer 2 and layer 3); (b) comparing with each of the one or more criteria of the first (Abstract discloses lookup tables for layer 2 and layer 3; an individual with ordinary skill in the art would be able to recognize a first table from this group); (ii) identifying one or more matches between the current packet and one or more pointers to a next table, each pointer associated with a match (Column 37, Lines 10-22 discloses generating a search key with is used to search for a match in rules tables and generating an action bit based on determined matches); (f) determining a score for each match identified (Column 37, Lines 10-22 discloses generating a search key with is used to search for a match in rules tables and generating an action bit based on determined matches); and (g) selecting the policy of the one or more policies associated (Column 34, Lines 17-19 discloses identifying the filter number, which is used to match entries in the rules table).

100. Kadambi discloses this difference for the purpose of advancing network switching technology which requires high performance switching of data packets or data cells. A switch utilizing the disclosed elements, and a system performing the disclosed steps, provides cost and operational savings (Column 1, Lines 29-35).

101. Therefore, it would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the multi-stage classification method disclosed by Messenger and add to it the feature as disclosed above by Kadambi to create a multi-stage classification method of selecting a policy from a plurality of policies based upon a plurality of protocol data unit (PDU) nibbles with high performance switching of data packets or data cells to provide cost and operational savings.

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102. Messenger in view of Kadambi do not expressly disclose a plurality of hierarchical tables; the plurality of hierarchical tables; (b) beginning with the criterion indicated by the first pointer; (c) identifying one or more matches between the first packet and one or more associated pointers to a child table; (d) searching a current child table with a current nibble; (i) comparing the current nibble with one or more criteria of the child table, with the criteria indicated by each of the one or more pointers obtained in a previous identifying step, and (ii) to a child; (e) repeating the searching step for each child table of the plurality of tables; (f) in each hierarchical table; and (g) at each of the plurality of hierarchical tables.

103. Chaddha discloses in the same field of endeavor a plurality of hierarchical tables (Column 5, Lines 9-17); (f) in each hierarchical table (Column 5, Lines 9-17 discloses hierarchical tables structures, constraints, and transforms in a table); and (g) at each of the plurality of hierarchical tables (Column 5, Lines 9-17 discloses hierarchical tables incorporate structures, constraints, and transforms in a table).

104. Chaddha discloses this difference for the purpose of providing a more optimal combination of effectiveness, speed, and scalability (Column 4, Lines 4-21).

105. Therefore, it would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify to modify the combined method of Messenger and Kadambi and add to it the feature as disclosed above by Chaddha to create a multi-stage classification method of selecting a policy from a plurality of policies based upon a plurality of protocol data unit (PDU) nibbles with a more optimal combination of effectiveness, speed, and scalability.

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106. Messenger in view of Kadambi and Chaddha do not expressly disclose comprising one **or** more child; (b) beginning with the criterion indicated by the first pointer; (c) identifying one or more matches between the first packet and one or more associated pointers to a child table; (d) searching a current child table with a current nibble; (i) comparing the current nibble with one or more criteria of the child table, with the criteria indicated by each of the one or more pointers obtained in a previous identifying step, and (ii) to a child; (e) repeating the searching step for each child table of the plurality of tables.

107. Takahashi discloses in the same field of endeavor comprising one **or** more child (Column 11, Lines 56-65); (c) a child (Column 11, Lines 56-65); (d) a current child (Column 11, Lines 56-65); (i) the child (Column 11, Lines 56-65); and (ii) to a child (Column 11, Lines 56-65).

108. Takahashi discloses this difference for the purpose of reducing data quantity and increase an efficiency of data processing (Column 1, Lines 9-20).

109. Therefore, it would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the combined method of Messenger, Kadambi, and Chaddha and add to it the feature as disclosed above by Takahashi to create a multi-stage classification method of selecting a policy from a plurality of policies based upon a plurality of protocol data unit (PDU) nibbles with reduced data quantity and increase an efficiency of data processing.

110. Messenger in view of Kadambi, Chaddha, and Takahashi do not expressly disclose (b) beginning with the criterion indicated by the first pointer; (c) identifying one or more matches between the first nibble and one or more associated pointers to a table; (d) searching table with a current nibble; (i) comparing the current nibble with one or more criteria of table, with the

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criteria indicated by each of the one or more pointers obtained in a previous identifying step; and (e) repeating the searching step for each child table of the plurality of tables.

111. Hebb discloses in the same field of endeavor (b) beginning with the criterion (Abstract discloses the criterion memory entry contains one or more values to be used as comparands on one side of the comparison, where corresponding values from a received packet appear on the other side of the comparison) indicated by the first pointer (Abstract discloses identified by the criterion memory pointer); (c) identifying one or more matches between the first packet and one or more associated pointers to a table (Abstract discloses defining a comparison operation to be performed, such as equal, between a criterion memory entry containing one or more values to be used as comparands on one side of the comparison, where corresponding values from a received packet appear on the other side of the comparison); (d) searching table with a current nibble (Column 1, Lines 27-47 discloses a specialized search of one or more forwarding tables for forwarding information on the packet); (i) comparing the current nibble with one or more criteria of table (Abstract discloses the criterion memory entry contains one or more values to be used as comparands on one side of the comparison, where corresponding values from a received packet appear on the other side of the comparison), with the criteria indicated by each of the one or more pointers (Abstract discloses defining a comparison operation to be performed, such as equal, between a criterion memory entry containing one or more values to be used as comparands on one side of the comparison, where corresponding values from a received packet appear on the other side of the comparison) obtained in a previous identifying step (Abstract discloses results provided to take the appropriate action based on the classification result; an individual with ordinary skill in the art would recognize that the data gathered from the previous

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step would be passed onto this step for further examination); and (e) repeating the searching step for each child table of the plurality of tables (Abstract discloses procedure is repeated for a sequence of rule memory entries until an ending condition is encountered).

112. Hebb discloses this difference for the purpose of providing high-speed packet classification for packet filtering purposes. The architecture of the classification apparatus provides substantial flexibility in the definition of complex filter criteria. Robust filtering can be performed at a sufficiently high rate to avoid degrading packet forwarding performance (Column 1, Line 66 – Column 2, Line 6).

113. Therefore, it would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the combined method of Messenger, Kadambi, Chaddha, and Takahashi and add to it the feature as disclosed above by Hebb to create a multi-stage classification method of selecting a policy from a plurality of policies based upon a plurality of protocol data unit (PDU) nibbles with high-speed classification for packet filtering to avoid degrading packet forwarding performance.

114. As for Claim 22, Messenger in view of Kadambi, Chaddha, Takahashi, and Hebb disclose the criteria (Messenger, Paragraph 0011 discloses lookup tables in memory for addresses and header information; an individual with ordinary skill in the art would recognize that the address in the table being written onto the nibble would point the nibble to the next location) of each hierarchical table are arranged in one or more criterion groups (Hebb, Abstract discloses the criterion memory entry contains one **or** more values to be used as comparands on one side of the comparison, where corresponding values from a received packet appear on the other side of the comparison), wherein each criterion of a criterion group in a child (Takahashi,



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Column 11, Lines 56-65) hierarchical (Chaddha, Column 5, Lines 9-17 discloses hierarchical tables incorporate structures, constraints, and transforms in a table) table (Hebb, Abstract discloses defining a comparison operation to be performed, such as equal, between a criterion memory entry containing one or more values to be used as comparands on one side of the comparison, where corresponding values from a received packet appear on the other side of the comparison) shares a common criterion (Hebb, Column 8, Lines 1-19 disclose three commonly addressed criterion) in an associated parent (Takahashi, Column 11, Lines 56-65 discloses parent) hierarchical table.

115. As for Claim 23, Messenger in view of Kadambi, Chaddha, Takahashi, and Hebb disclose the step of comparing the current nibble (Hebb, Abstract discloses defining a comparison operation to be performed, such as equal, between a criterion memory entry containing one or more values to be used as comparands on one side of the comparison, where corresponding values from a received packet appear on the other side of the comparison) with one or more criteria of the child (Takahashi, Column 11, Lines 56-65) table (Hebb, Column 1, Lines 27-47 discloses a specialized search of one or more forwarding tables for forwarding information on the packet) is confined to the criteria of one or more criterion groups (Takahashi, Column 11, Lines 56-65 disclose parent indexes, child indexes, parent packet “id,” and child packet “id”) beginning (Messenger, Paragraph 0140 discloses each novel circuit begins checking) with the criteria indicated by each of the one or more pointers pointers (Hebb, Abstract discloses defining a comparison operation to be performed, such as equal, between a criterion memory entry containing one or more values to be used as comparands on one side of the comparison, where corresponding values from a received packet appear on the other side of the

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comparison) obtained in a previous identifying step (Hebb, Abstract discloses results provided to take the appropriate action based on the classification result; an individual with ordinary skill in the art would recognize that the data gathered from the previous step would be passed onto this step for further examination).

116. Claim 24-27 rejected under 35 U.S.C. 103(a) as being unpatentable over Brian Scott Messenger (US 2003/0231630) in view of Kadambi et al (US 6,707,817), Navin Chaddha (US 6,154,572), Toshiya Takahashi (US 6,633,592), Hebb et al (US 6,587,463) and Henderson et al (US 5,726,979).

117. As for Claim 24, Messenger discloses a multi-stage (Paragraph 0011 discloses lookup tables) classification method (Abstract discloses packet classification architecture) based upon a plurality of protocol data unit (PDU; Paragraph 0012 discloses an Application Specific Integrated Circuit to evaluate packet headers in a rapid fashion which an individual with ordinary skill in the art would recognize to have corresponding functions to a PDU) nibbles (Paragraph 0107 discloses input data manipulated in 32-bit words; an individual with ordinary skill in the art would recognize that a nibble comprises one or more bits), the method comprising the steps of: (a) generating, from a first nibble (Paragraph 0107 discloses input data manipulated in 32-bit words; an individual with ordinary skill in the art would recognize that a nibble comprises one or more bits), a first pointer (Paragraph 0108 discloses generating a randomizer value) to a first table (Paragraph 0111 discloses randomizer value pointing to a location in a table) of a plurality of tables (Paragraph 0111 discloses multiple entry tables) that embody the policies (Paragraph 0011 discloses lookup tables in memory for addresses and header information), each table comprising one or more criteria and associated pointer (Paragraph 0011 discloses lookup tables

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in memory for addresses and header information; an individual with ordinary skill in the art would recognize that the address in the table being written onto the nibble would point the nibble to the next location);

(b) the first nibble (Paragraph 0107 discloses input data being manipulated into 32-bit words; an individual with ordinary skill in the art would recognize this as a nibble)

(c) the first nibble (Paragraph 0107 discloses input data being manipulated into 32-bit words; an individual with ordinary skill in the art would recognize this as a nibble)

(d) the plurality of nibbles (Paragraph 0015 discloses a sequence of words), the searching step further comprising:

(i) beginning (Paragraph 0140 discloses each novel circuit begins checking), and

(ii) the current nibble (Paragraph 0107 discloses input data manipulated in 32-bit words; an individual with ordinary skill in the art would recognize that a nibble comprises one or more bits).

118. Messenger does not expressly disclose of selecting a policy from a plurality of policies; the plurality of policies being embodied in a plurality of hierarchical tables; the plurality of hierarchical tables comprising a first table and one or more child tables; (b) comparing the first packet with each of the one or more criteria of the first table beginning with the criterion indicated by the first pointer; (c) identifying one or more matches between the first packet and one or more associated pointers to a child table; (d) searching a current child table with a current nibble; (i) comparing the current nibble with one or more criteria of the child table, with the criteria indicated by each of the one or more pointers obtained in a previous identifying step, and (ii) identifying one or more matches between the current packet and one or more pointers to a

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next child table, each pointer associated with a match; (e) if no match is detected in the search step: (i) reverting to the previous table, and (ii) resuming the searching step; and (f) repeating the searching step for each child table of the plurality of tables and a policy is matched.

119. Kadambi discloses in the same field of endeavor of selecting a policy from a plurality of policies (Column 34, Lines 17-19 discloses identifying the filter number, which is used to match entries in the rules table); the plurality of policies being embodied in a plurality of tables (Abstract discloses lookup tables for layer 2 and layer 3) the plurality of tables comprising a first (Abstract discloses lookup tables for layer 2 and layer 3; an individual with ordinary skill in the art would be able to recognize a first table from this group) and one or more tables (Abstract discloses lookup tables for layer 2 and layer 3); (b) comparing with each of the one or more criteria of the first (Abstract discloses lookup tables for layer 2 and layer 3; an individual with ordinary skill in the art would be able to recognize a first table from this group); (ii) identifying one or more matches between the current packet and one or more pointers to a next table, each pointer associated with a match (Column 37, Lines 10-22 discloses generating a search key with is used to search for a match in rules tables and generating an action bit based on determined matches); (e) if no match is detected in the search step (Column 37, Lines 10-22); and (f) a policy is matched (Column 37, Lines 10-22 discloses generating a search key with is used to search for a match in rules tables and generating an action bit based on determined matches).

120. Kadambi discloses this difference for the purpose of advancing network switching technology which requires high performance switching of data packets or data cells. A switch utilizing the disclosed elements, and a system performing the disclosed steps, provides cost and operational savings (Column 1, Lines 29-35).

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121. Therefore, it would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the multi-stage classification method disclosed by Messenger and add to it the feature as disclosed above by Kadambi to create a multi-stage classification method of selecting a policy from a plurality of policies based upon a plurality of protocol data unit (PDU) nibbles with high performance switching of data packets or data cells to provide cost and operational savings.

122. Messenger in view of Kadambi do not expressly disclose a plurality of hierarchical tables; the plurality of hierarchical tables; (b) beginning with the criterion indicated by the first pointer; (c) identifying one or more matches between the first nibble and one or more associated pointers to a child table; (d) searching a current child table with a current nibble; (i) comparing the current nibble with one or more criteria of the child table, with the criteria indicated by each of the one or more pointers obtained in a previous identifying step, and (ii) to a child; (i) reverting to the previous table, and (ii) resuming the searching step; and (f) repeating the searching step for each child table of the plurality of tables.

123. Chaddha discloses in the same field of endeavor a plurality of hierarchical tables (Column 5, Lines 9-17).

124. Chaddha discloses this difference for the purpose of providing a more optimal combination of effectiveness, speed, and scalability (Column 4, Lines 4-21).

125. Therefore, it would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify to modify the combined method of Messenger and Kadambi and add to it the feature as disclosed above by Chaddha to create a multi-stage classification method of selecting a policy from a plurality of policies based upon a plurality of

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protocol data unit (PDU) nibbles with a more optimal combination of effectiveness, speed, and scalability.

126. Messenger in view of Kadambi and Chaddha do not expressly disclose comprising one **or** more child; (b) beginning with the criterion indicated by the first pointer; (c) identifying one or more matches between the first nibble and one or more associated pointers to a child table; (d) searching a current child table with a current nibble; (i) comparing the current nibble with one or more criteria of the child table, with the criteria indicated by each of the one or more pointers obtained in a previous identifying step, and (ii) to a child; (i) reverting to the previous table, and (ii) resuming the searching step; and (f) repeating the searching step for each child table of the plurality of tables.

127. Takahashi discloses in the same field of endeavor comprising one **or** more child (Column 11, Lines 56-65); (c) a child (Column 11, Lines 56-65); (d) a current child (Column 11, Lines 56-65); (i) the child (Column 11, Lines 56-65); and (ii) to a child (Column 11, Lines 56-65).

128. Takahashi discloses this difference for the purpose of reducing data quantity and increase an efficiency of data processing (Column 1, Lines 9-20).

129. Therefore, it would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the combined method of Messenger, Kadambi, and Chaddha and add to it the feature as disclosed above by Takahashi to create a multi-stage classification method of selecting a policy from a plurality of policies based upon a plurality of protocol data unit (PDU) nibbles with reduced data quantity and increase an efficiency of data processing.

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130. Messenger in view of Kadambi, Chaddha, and Takahashi do not expressly disclose (b) beginning with the criterion indicated by the first pointer; (c) identifying one or more matches between the first nibble and one or more associated pointers to a table; (d) searching table with a current nibble; (i) comparing the current nibble with one or more criteria of table, with the criteria indicated by each of the one or more pointers obtained in a previous identifying step; and (i) reverting to the previous table, and (ii) resuming the searching step; and (f) repeating the searching step for each child table of the plurality of tables..

131. Hebb discloses in the same field of endeavor (b) beginning with the criterion (Abstract discloses the criterion memory entry contains one or more values to be used as comparands on one side of the comparison, where corresponding values from a received packet appear on the other side of the comparison) indicated by the first pointer (Abstract discloses identified by the criterion memory pointer); (c) identifying one or more matches between the first nibble and one or more associated pointers to a table (Abstract discloses defining a comparison operation to be performed, such as equal, between a criterion memory entry containing one or more values to be used as comparands on one side of the comparison, where corresponding values from a received packet appear on the other side of the comparison); (d) searching table with a current nibble (Column 1, Lines 27-47 discloses a specialized search of one or more forwarding tables for forwarding information on the packet); (i) comparing the current nibble with one or more criteria of table (Abstract discloses the criterion memory entry contains one or more values to be used as comparands on one side of the comparison, where corresponding values from a received packet appear on the other side of the comparison), with the criteria indicated by each of the one or more pointers (Abstract discloses defining a comparison operation to be performed, such as

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equal, between a criterion memory entry containing one or more values to be used as comparands on one side of the comparison, where corresponding values from a received packet appear on the other side of the comparison) obtained in a previous identifying step (Abstract discloses results provided to take the appropriate action based on the classification result; an individual with ordinary skill in the art would recognize that the data gathered from the previous step would be passed onto this step for further examination); and (i) table (Abstract discloses defining a comparison operation to be performed, such as equal, between a criterion memory entry containing one or more values to be used as comparands on one side of the comparison, where corresponding values from a received packet appear on the other side of the comparison), and (f) repeating the searching step (Abstract discloses procedure is repeated for a sequence of rule memory entries until an ending condition is encountered) for each child (Takahashi, Column 11, Lines 56-65) table of the plurality of tables (Hebb, Column 1, Lines 27-47 discloses a specialized search of one or more forwarding tables for forwarding information on the packet)

132. Hebb discloses this difference for the purpose of providing high-speed packet classification for packet filtering purposes. The architecture of the classification apparatus provides substantial flexibility in the definition of complex filter criteria. Robust filtering can be performed at a sufficiently high rate to avoid degrading packet forwarding performance (Column 1, Line 66 – Column 2, Line 6).

133. Therefore, it would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the combined method of Messenger, Kadambi, Chaddha, and Takahashi and add to it the feature as disclosed above by Hebb to create a multi-stage classification method of selecting a policy from a plurality of policies based upon a



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plurality of protocol data unit (PDU) nibbles with high-speed classification for packet filtering to avoid degrading packet forwarding performance.

134. Messenger in view of Kadambi, Chaddha, Takahashi and Hebb do not expressly disclose (i) reverting to the previous; and (ii) resuming the searching step.

135. Henderson discloses in the same field of endeavor (i) reverting to the previous (Column 22, Lines 40-49 discloses revertive switching with an order of preference of priority values being established); and (ii) resuming the searching step (Column 24, Lines 16-23 disclose the process determines that other data streams must be processed, then execution resumes to select one of the remaining unprocessed data streams).

136. Henderson discloses these differences for the purpose of managing diverse network equipments conforming to a variety of interface standards, which determine the current state of a network, restore it to a state satisfying various engineering guidelines, and be flexible enough to allow upgrades without violating the engineering design guidelines (Column 2, Lines 16-26).

137. Therefore, it would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the combined method of Messenger, of Kadambi, Chaddha, Takahashi and Hebb and add to it the feature as disclosed above by Henderson Hebb to create a multi-stage classification method of selecting a policy from a plurality of policies based upon a plurality of protocol data unit (PDU) nibbles managing diverse network equipments conforming to a variety of interface standards, which determine the current state of a network, restore it to a state satisfying various engineering guidelines, and be flexible enough to allow upgrades without violating the engineering design guidelines.

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138. As for Claim 25, Messenger in view of Kadambi, Chaddha, Takahashi, Hebb, and Henderson disclose the method further includes the steps of determining a score for each match identified (Kadambi, Column 37, Lines 10-22 discloses generating a search key with is used to search for a match in rules tables and generating an action bit based on determined matches) in each hierarchical table (Chaddha, Column 5, Lines 9-17 discloses tables are hierarchical tables).

139. As for Claim 26, Messenger in view of Kadambi, Chaddha, Takahashi, Hebb, and Henderson disclose the criteria (Messenger, Paragraph 0011 discloses lookup tables in memory for addresses and header information; an individual with ordinary skill in the art would recognize that the address in the table being written onto the nibble would point the nibble to the next location) of each hierarchical table are arranged in one or more criterion groups (Hebb, Abstract discloses the criterion memory entry contains one or more values to be used as comparands on one side of the comparison, where corresponding values from a received packet appear on the other side of the comparison), wherein each criterion of a criterion group in a child (Takahashi, Column 11, Lines 56-65) hierarchical (Chaddha, Column 5, Lines 9-17 discloses hierarchical tables incorporate structures, constraints, and transforms in a table) table (Hebb, Abstract discloses defining a comparison operation to be performed, such as equal, between a criterion memory entry containing one or more values to be used as comparands on one side of the comparison, where corresponding values from a received packet appear on the other side of the comparison) shares a common criterion (Hebb, Column 8, Lines 1-19 disclose three commonly addressed criterion) in an associated parent (Takahashi, Column 11, Lines 56-65 discloses parent) hierarchical table.

140. As for Claim 27, Messenger in view of Kadambi, Chaddha, Takahashi, Hebb, and Henderson disclose the step of comparing the current nibble (Hebb, Abstract discloses defining a comparison operation to be performed, such as equal, between a criterion memory entry containing one or more values to be used as comparands on one side of the comparison, where corresponding values from a received packet appear on the other side of the comparison) with one or more criteria of the child (Takahashi, Column 11, Lines 56-65) table (Hebb, Column 1, Lines 27-47 discloses a specialized search of one or more forwarding tables for forwarding information on the packet) is confined to the criteria of one or more criterion groups (Takahashi, Column 11, Lines 56-65 disclose parent indexes, child indexes, parent packet “id,” and child packet “id”) beginning (Messenger, Paragraph 0140 discloses each novel circuit begins checking) with the criteria indicated by each of the one or more pointers pointers (Hebb, Abstract discloses defining a comparison operation to be performed, such as equal, between a criterion memory entry containing one or more values to be used as comparands on one side of the comparison, where corresponding values from a received packet appear on the other side of the comparison) obtained in a previous identifying step (Hebb, Abstract discloses results provided to take the appropriate action based on the classification result; an individual with ordinary skill in the art would recognize that the data gathered from the previous step would be passed onto this step for further examination).

141. Claim 28 rejected under 35 U.S.C. 103(a) as being unpatentable over Brian Scott Messenger (US 2003/0231630) in view of Hebb et al (US 6,587,463) and Kadambi et al (US 6,707,817).

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142. As for Claim 28, Messenger discloses a multi-stage (Paragraph 0011 discloses lookup tables) classification method (Abstract discloses packet classification architecture) for matching a plurality of strings (Paragraph 0069 discloses matching input data patterns) to one or more policies (Paragraph 0011 discloses lookup tables in memory for addresses and header information) embodied in a plurality of stages (Paragraph 0111 discloses saving and retrieving values from various equation mapping tables), each stage comprising one or more entries (Paragraph 0111 discloses multiple entry tables); the method comprising the steps of:

(a) generating a current pointer (Paragraph 0108 discloses generating a randomizer value) to a current stage (Paragraph 0111 discloses randomizer value pointing to a location in a table) using a current string (Paragraph 0107 discloses input data being manipulated in bit words);

(b) the searching step further comprising the steps of:

(ii) new pointers (Paragraph 0327 discloses generating a pointer, therefore a new pointer is in existence), wherein each of the new pointers (Paragraph 0327 discloses generating a pointer, therefore a new pointer is in existence), and

(iii) incrementing the current string (Paragraph 0164 discloses a value is incremented after each word is written to, or read).

143. Messenger does not expressly disclose each entry comprising a criterion and a pointer to a subsequent stage; (b) searching one or more criteria in the current stage; (i) comparing the current string to the criteria of one or more entries beginning with entries indicated by the one or more current pointers; (ii) defining the one or more current pointers equal to one **or** more; is associated with a criterion in the current stage that matches the current string; (iii) incrementing the current stage; (c) repeating the searching step for each of the plurality of stages; (d)

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generating a score for each match identified in each of the plurality of stages; and (e) selecting the policy of the one or more policies associated with a highest cumulative score, the cumulative score being the sum of the score for each match at each stage of the plurality of stages.

144. Hebb discloses in the same field of endeavor each entry comprising a criterion and a pointer to a subsequent stage (Column 9, Lines 35-39 discloses if any rule memory entry encountered in the search is a pointer type of entry, it points to another rule memory entry); (b) searching one or more criteria in the current stage (Column 1, Lines 27-47 discloses a specialized search of one or more forwarding tables for forwarding information on the packet); (i) comparing the current string to the criteria of one or more entries beginning with entries (Abstract discloses the criterion memory entry contains one or more values to be used as comparands on one side of the comparison, where corresponding values from a received packet appear on the other side of the comparison) indicated by the one or more current pointers (Abstract discloses identified by the criterion memory pointer); (ii) defining the one or more current pointers equal to one **or** more (Abstract discloses defining a comparison operation to be performed, such as equal, between a criterion memory entry containing one or more values to be used as comparands on one side of the comparison, where corresponding values from a received packet appear on the other side of the comparison); is associated with a criterion in the current stage that matches the current string (Abstract discloses the criterion memory entry identified by the criterion memory pointer); (iii) incrementing the current stage (Column 11, Lines 54-59 discloses rule memory address increments by one); and (c) repeating the searching step for each of the plurality of stages (Abstract discloses procedure is repeated for a sequence of rule memory entries).

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145. Hebb discloses this difference for the purpose of providing high-speed packet classification for packet filtering purposes. The architecture of the classification apparatus provides substantial flexibility in the definition of complex filter criteria. Robust filtering can be performed at a sufficiently high rate to avoid degrading packet forwarding performance (Column 1, Line 66 – Column 2, Line 6).

146. Therefore, it would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the multi-stage classification method disclosed by Messenger and add to it the feature as disclosed above by Hebb to create a multi-stage classification method of matching a plurality of strings to one or more policies embodied in a plurality of stages with high-speed classification for packet filtering to avoid degrading packet forwarding performance.

147. Messenger in view of Hebb do not expressly disclose (d) generating a score for each match identified in each of the plurality of stages; and (e) selecting the policy of the one or more policies associated with a highest cumulative score, the cumulative score being the sum of the score for each match at each stage of the plurality of stages.

148. Kadambi discloses in the same field of endeavor (d) generating a score for each match identified in each of the plurality of stages (Column 37, Lines 10-22 discloses generating a search key with is used to search for a match in rules tables and generating an action bit based on determined matches); and (e) selecting the policy of the one or more policies associated (Column 34, Lines 17-19 discloses identifying the filter number, which is used to match entries in the rules table) with a highest cumulative score, the cumulative score being the sum of the score for each match at each stage of the plurality of stages (Column 37, Lines 32-36 discloses a full

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match occurs when the filter select+egress module id+igress port+egress port+packet format+filter value matches an entry in the rules table; therefore, if there is a full match, then the associated actions from the matched rules table entry are applied).

149. Kadambi discloses this difference for the purpose of advancing network switching technology which requires high performance switching of data packets or data cells. A switch utilizing the disclosed elements, and a system performing the disclosed steps, provides cost and operational savings (Column 1, Lines 29-35).

150. Therefore, it would have been obvious to one of ordinary skill in the art at the time the applicant's invention was made to modify the combined method of Messenger and Hebb and add to it the feature as disclosed above by Kadambi to create a multi-stage classification method of matching a plurality of strings to one or more policies embodied in a plurality of stages with high performance switching of data packets or data cells to provide cost and operational savings.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ROBERT ROOT whose telephone number is 571-270-1960. The examiner can normally be reached on Monday to Friday from 7:30am to 5:00pm Eastern.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Huy Vu can be reached on 571-272-3155. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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